

Claims

1. A metal bellows tube wherein sectional shapes of a ridge and a valley in a bellows-shaped tube wall are V-shaped.
- 5 2. The metal bellows tube of claim 1, wherein the pitch of the bellows is 1.5 mm or less, and the height of the ridge is 0.5 - 4.0 mm.
3. The metal bellows tube of claim 2, wherein the thickness of
10 the wall of the bellows-shaped tube is 0.1 - 0.3 mm.
4. The metal bellows tube of any of claims 1 to 3, wherein the tube has an outside diameter of 4.5 - 20 mm.
- 15 5. A method of producing a metal bellows tube, which comprises preparing a metal bellows fundamental tube wherein sectional shapes of a ridge and a valley in a bellows-shaped tube wall are U-shaped, compressing said fundamental tube in the longitudinal direction to bring adjacent ridges and valleys of
20 the bellows-shaped tube wall into close contact with each other, further pressure-forming the tube until the inside space of each ridge and the gap between adjacent ridges substantially disappear by pressing, and then stretching, in the longitudinal direction of the tube, the fundamental tube after the pressure
25 forming until a peak-to-peak gap of the adjacent ridges reaches a predetermined distance.
6. The production method of claim 5, wherein the peak-to-peak gap between adjacent ridges is 1.5 mm or less, and the height
30 of the ridge is 0.5 - 4.0 mm, after stretching, in the longitudinal direction of the tube, of the above fundamental tube after the pressure forming.
7. A flexible tube for a high-pressure fluid, which is capable

of transferring a high-pressure fluid of 70 MPa, and which
 comprises a metal bellows tube and a tubular metal braid
 covering the outside of said tube, wherein
 the metal bellows tube has been formed such that a ridge and a
 5 valley in the bellows-shaped tube wall have a V-shaped
 sectional shape,
 the tubular metal braid has both ends joined with the
 respectively corresponding both ends of the metal bellows tube,
 and
 10 the total sectional area S of the metal braid member and the
 material of the metal strand are determined so as to satisfy

$$(\sigma \times \cos (\theta/2))/n \geq F/S$$
 wherein F [N] is a force of a high-pressure fluid which acts to
 stretch a metal bellows tube, S [mm²] is the total sectional
 15 area of a metal strand appearing on the cross-section of the
 metal braid, a crossing angle θ of the metal braid = 50 - 120
 degrees, σ [MPa] is a tensile strength of the material of said
 metal strand, and n is a safety factor.

20 8. The flexible tube of claim 7, wherein the force F is 1374 -
 17813 [N] and the safety factor n is 4.

9. The flexible tube of claim 7, wherein the high-pressure
 fluid is a hydrogen gas or a mixture of a hydrogen gas and
 25 liquid hydrogen.

10. The flexible tube of claim 7, wherein the both ends of the
 metal bellows tube have a metal pipe as a mouth piece, and the
 mouth piece is joined with the end of the metal braid by
 30 welding or brazing.

11. The flexible tube of claim 7, wherein the end of the metal
 braid is joined with a mouth piece by brazing, the end of the
 metal braid is furnished with a braid presser ring covering the

braid, the metal braid and the braid presser ring are brazed to the mouth piece, with the end faces approximately at an even position, the braid presser ring has a through hole that exposes the metal braid at a predetermined position from the
5 end face, and the through hole allows confirmation of penetration of a solder in the braid at least to the predetermined position.

12. The flexible tube of claim 7, wherein the end of the metal
10 braid is joined with a mouth piece by brazing, the end of the metal braid is furnished with a braid presser ring covering the braid, the metal braid and the braid presser ring are brazed to the mouth piece, with the end faces approximately at an even position, and the inside of the braid presser ring and/or the
15 outside of the mouth piece comprises a circular recess or single recess that allows a solder to flow therein and serves as a stopper.

13. The flexible tube of claim 7, wherein the metal bellows
20 tube has a pitch of the bellows of 2 mm or less, and a height of the ridge of 1 - 4 mm.

14. The flexible tube of claim 7, wherein the thickness of the wall of the bellows-shaped tube is 0.1 - 0.5 mm.

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15. The flexible tube of claim 7, wherein the metal bellows tube has an inside diameter of 4 - 17 mm.

16. The flexible tube of claim 7, wherein the metal bellows
30 tube is formed by the production method of claim 5.

17. The flexible tube of claim 7, wherein the above-described force F is 1374 - 17813 [N] and $n = 4$, the metal bellows tube is made of stainless steel, and has an

inside diameter of 4 - 17 mm and a thickness of the wall of the bellows-shaped tube of 0.1 - 0.5 mm, and the metal braid has a structure wherein a densely braided layer comprising strands made of stainless steel and having a diameter of 0.3 mm in strand number of 6 - 10 is superposed in 2 to 6 layers on the outside of the metal bellows tube.